What Is Claimed Is:

1. A method of managing data traffic in an optical network, comprising the steps of:
routing at least one wavelength through a WBS network; and,
converting said at least one wavelength by MG-OXC.

2. The method of Claim 1 further comprising the step of protecting and restoring said at least one wavelength.

3. The method of Claim 1 wherein said traffic is off-line.

4. The method of Claim 1 wherein said traffic is on-line.

5. A method of managing data traffic in an optical network, comprising the steps of:
routing at least one waveband through a WBS network; and,
converting said at least one waveband by MG-OXC.

6. The method of Claim 5 further comprising the step of protecting and restoring said at least one wavelength.

7. The method of Claim 5 wherein said traffic is off-line.

8. The method of claim 5 wherein said traffic is on-line.

9. An apparatus for managing data traffic in an optical network, comprising:
means for routing at least one wavelength through a WBS network; and,
means for converting said at least one wavelength by MG-OXC.

10. An apparatus for managing data traffic in an optical network, comprising:
means for routing at least one waveband through a WBS network; and,
means for converting said at least one waveband by MG-OXC.

11. A method for managing static data traffic of at least one light path in an optical network, comprising the steps of:

achieving load balanced path routing for said at least one light path;

assigning wavelengths to demands of said at least one light path; and,

switching said at least one light path according to its assigned wavelength.

12. The method of Claim 11 wherein said step of achieving load balance routing comprises the steps of:

finding a K-shortest route for every node pair (s,d) with non-zero traffic demand;

ordering said node pair routes $(P_{s,d})$ from the shortest to the longest, in terms of hop number (H), wherein $P^1_{s,d},\ P^2_{s,d}, \ldots, P^k_{s,d}$ and letting the number of hops of the shortest route be $H_{s,d}$ (i.e., number of hops in path $P^1_{s,d}$);

defining the load on every link l to be the number of routes already using link l with C being the maximum link load over all the links; and,

using C to accomplish said step of achieving load balance by starting with the node pair (s,d) with the largest $H_{s,d}$ value over all node pairs, to determine the route for each node pair.

13. The method of Claim 11, wherein said step of assigning wavelengths, comprises the steps of:

defining a set Q^s_d, which includes all node pairs (s_i, s_j), whose route is $s_i, s_{i+1}, \ldots, s_j$, as determined in said step of achieving load balanced path routing, where $0 \leq i \leq n-2$, and $i + 2 \leq j \leq n$, for every node pair (s,d), whose route is determined as $s = s_o \rightarrow s_1 \rightarrow s_2 \ldots s_{n-1} \rightarrow s_n = d$ in said step of achieving load balanced path routing;

calculating the weight for each set Q^s_d as $W_{sd} = \sum_{p \in Q^s_d} hp \times t_p$, where $p = (s_i, s_j) \in Q^s_d$, h_p is the number of hops and t_p is the required number of light paths from s_i to s_j;

finding the set Q^s_d with the largest $W_{sd}{}^*$;

calling set Q^s_d as $\mathcal{L}$, and assigning wavelengths to $\mathcal{L}$; and,

recomputing the weight for those node pairs whose routes use any part of the route used by node pair (*s*,*d*) by, for each fiber, re-adjusting b and w to be the "next" waveband and the first wavelength in the next waveband, respectively, so as to prevent the light paths of the next node pair set (e.g., $Q_{d'}^{s'}$) from using the same bands as the light paths of Q_d^s.

14. The method of Claim 13 wherein said step of assigning wavelengths to $\mathcal{L}$, comprises the steps of:

assigning a longest path in $\mathcal{L}$ is as follows: $s_0 \rightarrow s_1 \rightarrow s_2 \ldots s_{n-1} \rightarrow s_n$ wherein $s = s_0$ and $d = s_n$;

assigning wavelengths to the requested light paths for the node pair (*s*,*d*) by grouping them into the same fiber, and within each fiber, into the same band, wherein for each fiber, $0 \leq w \leq \mathcal{K} - 1$ and $0 \leq b \leq B - 1$ is the index of wavelength and band respectively, starting from which, an available wavelength and band are searched in order to fulfill new light path requests, and $0 \leq f \leq F - 1$ is the index of the fiber currently under consideration;

using a *WA-MF-WBS* algorithm to assign wavelengths to the requested light paths for (s, s_j), starting with the largest j (i.e., $j = n - 1, n - 2, \ldots, 2$);

using said *WA-MF-WBS* algorithm to assign wavelengths to the requested light paths for (s_i, d) starting with the smallest i (i.e., $i = 1, 2\ldots, n - 2$); and,

repeating said *WA-MF-WBS* assignments by treating s_i with the smallest i as s, and s_j with the largest j as d until all said node pairs $(s_i, s_j) \in Q_d^s$ have been considered.

15. The method of Claim 14, wherein the *WA-MF-WBS* algorithm is:

while $t_p > \mathrm{W}$ **do**

Find a fiber starting from index f that has as many free bands as possible (say $a \leq \left\lfloor \frac{tp}{W} \right\rfloor$){

Call the found fiber g, where g may or may not be the same as f;

Assign the bands in fiber g to the a. W light paths for p;

$t_p = t_p - a \,.\, W$;

Set f = g, and update w and b for fiber g accordingly;

}

end while

while $t_p > 0$ **do**

Find a fiber (g), starting from index f, that has at least one free wavelength;

Assign a free wavelength (x), starting from index w, to a light path for p, where x is most likely to be w;

$t_p = t_p - 1$;

Set f = g, and w = x + 1. Also, update b for fiber g accordingly;

end while

16. A method for managing dynamic data traffic of at least one light path in an optical network, comprising the steps of:

routing the K-shortest path, which has the largest interference length (L); and,

assigning waveband with a First-Fit network topology based on band/port number restriction and minimum weight.

17. The method of Claim 16, wherein said First-Fit network topology includes at least one fiber, wherein each fiber has two bands b_0 and b_1, and each band has two wavelengths, at least two light paths: $\lambda_0(S_2 \rightarrow S_3)$ and $\lambda_2(S_4 \rightarrow S_5 \rightarrow S_6 \rightarrow S_7)$ and a new light path demand from S_0 to S_7 so there are at least two paths to route the demand: $k_0\,(S_0 \rightarrow S_1 \rightarrow S_2 \rightarrow S_3 \rightarrow S_7)$ and k_1 $(S_0 \rightarrow S_4 \rightarrow S_5 \rightarrow S_6 \rightarrow S_7)$; further comprising the steps of:

attempting to satisfy a new light path demand by, within every layer by a method comprising the steps of:

calculating the weight for every (k,b) pair, $W^b_{k,}$ where $0 \leq k < K$ is the index of shortest path, $0 \leq b < B$ is index of band,

finding the minimum W^b_k, which can satisfy the demand,

assigning the corresponding wavelength to the new demand in layer b, using the *kth* shortest path; and,

blocking said light path demand if no layer can satisfy it.

18. The method of Claim 17, wherein the method to set the weight is selected from the group consisting of $W_k^b = h$, where h is the hop number, $W_k^b = \frac{1}{L,}$ where L is interference length L (number of shared links), and $W_k^b = \frac{h}{L}$.